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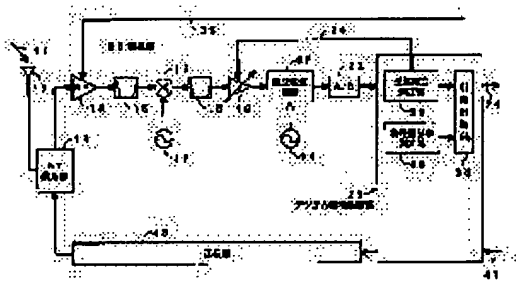
(54) PORTABLE COMMUNICATION EQUIPMENT

(57)Abstract:

PROBLEM TO BE SOLVED: To improve the linearity of a reception circuit and to improve characteristics to interference waves without increasing current consumption more than needed in a portable communication equipment such as a digital portable telephone terminal using a direct spread spectrum communication system.



SOLUTION: In the reception power measurement part 31 of a digital signal processing part 23, reception electric field strength is measured from base band signals demodulated by an orthogonal detection circuit 20 and digitized by an A/D converter 22. In a code error rate measurement part 32, a code error rate in error correction performed in the digital signal processing part 23 for the base band signals from the A/D converter 22 is measured. In a judgement control part 33, when the reception electric field strength is more than prescribed electric field strength and the code error rate is higher than a prescribed error rate, it is judged that reception signals are interfered by the interference waves, the current of an RF amplifier circuit 14 is increased compared to the time of judging that the reception signals are not interfered by the interference waves and the linearity of the RF amplifier circuit 14 is improved.

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LEGAL STATUS

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CLAIMS

[Claim(s)]
[Claim 1] With the receive section which changes an input signal into an intermediate frequency signal, and detects the intermediate frequency signal The received field strength detecting element which detects the received field strength of said input signal, and the digital error rate detecting element which detects the digital error rate in the error correction of said input signal, When the received field strength detected by said received field strength detecting element is more than predetermined field strength and the digital error rate detected by said digital error rate detecting element is beyond a predetermined error rate, So that linearity of the circuit which constitutes said receive section may be made good compared with the time of judging with said input signal having received active jamming by the interference, and judging with said input signal having not received active jamming by the interference The pocket communication device characterized by having the judgment control section which controls said receive section.
[Claim 2] It is the pocket communication device which said circuit is an RF amplifying circuit and is characterized by said judgment control section making the current of said RF amplifying circuit increase compared with the time of judging with said input signal having not received active jamming by the interference when it judges with said input signal having received active jamming by the interference in the pocket communication device of claim 1.
[Claim 3] It is the pocket communication device characterized by for said digital error rate detecting element comparing the input signal before an error correction with the input signal after an error correction in the pocket communication device of claims 1 or 2, and judging with a digital error rate being beyond a predetermined error rate when the difference among both is more than fixed.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to pocket communication devices, such as a digital cellular phone terminal which used direct spread spectrum communication.
[0002]
[Description of the Prior Art] The digital cellular phone terminal of a CDMA (Code Division Multiple Access) method using the direct spectrum diffusion which carries out spectrum diffusion of the signal transmission with a diffusion sign is actual.
[0003] A CDMA method is a method which transmits two or more spectrum diffusion signal transmission which carried out spectrum diffusion with a mutually different diffusion sign to the same time zone and the same frequency band, and identifies each signal using the difference in a diffusion sign. Since two or more spectrum diffusion signal transmission can be transmitted to the same time zone and the same frequency band by changing a diffusion sign Since it excels in secrecy nature while the radio circuits used at a cellular-phone terminal do not run short, the user of a cellular-phone terminal can be provided with good communication environment.
[0004]
[Problem(s) to be Solved by the Invention] By the way, in a cellular-phone communication link, since FM signal transmission and spectrum diffusion signal transmission are assigned to the same communication link frequency band in recent years, FM signal transmission may exist as an interference near the spectrum diffusion signal transmission. At the digital cellular phone terminal using direct spread spectrum communication By changing an input signal into an intermediate frequency signal, and supplying the diffusion band which is a frequency band of spectrum diffusion signal transmission about the intermediate frequency signal after the conversion to the band pass filter made into a passband Although an unnecessary frequency component is removed from an input signal and he is trying to extract only desired spectrum diffusion signal transmission In the band pass filter, an interference like FM signal transmission assigned to the communication link frequency band same as mentioned above as spectrum diffusion signal transmission is unremovable.
[0005] Therefore, in order to avoid an intermodulation and cross modulation in case such an interference exists conventionally, when receiving level is more than fixed, linearity of a receiving circuit is made good by making the current of a receiving circuit increase etc.
[0006] However, neither an intermodulation nor cross modulation is necessarily produced by the interference just because receiving level is high. And the life of a cell will become short, if the current of a receiving circuit is made to always increase since it especially awaits at a cellular-phone terminal and the consumed electric current in the receiving circuit at the time influences the life of a cell greatly when receiving level is more than fixed.
[0007] Then, without increasing the consumed electric current beyond the need, this invention makes linearity of a receiving circuit good, and enables it to improve the property over an interference in pocket communication devices, such as a digital cellular phone terminal which used direct spread

spectrum communication.
[0008]
[Means for Solving the Problem] With the receive section which changes an input signal into an intermediate frequency signal, and detects that intermediate frequency signal as a pocket communication device in this invention The received field strength detecting element which detects the received field strength of said input signal, and the digital error rate detecting element which detects the digital error rate in the error correction of said input signal, When the received field strength detected by said received field strength detecting element is more than predetermined field strength and the digital error rate detected by said digital error rate detecting element is beyond a predetermined error rate, The judgment control section which controls said receive section is prepared so that linearity of the circuit which constitutes said receive section may be made good compared with the time of judging with said input signal having received active jamming by the interference, and judging with said input signal having not received active jamming by the interference.
[0009] In this case, said circuit is made into RF amplifying circuit, and said judgment control section makes the current of said RF amplifying circuit increase compared with the time of judging with said input signal having not received active jamming by the interference, when it judges with said input signal having received active jamming by the interference.
[0010] Neither an intermodulation nor cross modulation is necessarily produced by the interference just because receiving level is high, as mentioned above. And even if received field strength is more than predetermined field strength, unless an interference which affects the target input signal exists, the digital error rate in the error correction of an input signal seldom deteriorates, but if an interference which affects the target input signal exists, the digital error rate in the error correction of an input signal will deteriorate.
[0011] This point is noted in the pocket communication device of this invention. As mentioned above When received field strength is more than predetermined field strength and a digital error rate is beyond a predetermined error rate, Even if it judges with the input signal having received active jamming by the interference and received field strength is more than predetermined field strength, when a digital error rate is under a predetermined error rate Since it judges with the input signal having not received active jamming by the interference, while it is certainly detectable whether the input signal has received active jamming by the interference Since linearity of the circuit concerned is made good by making the current of circuits, such as RF amplifying circuit which constitutes a receive section, increase etc. when it judges with the input signal having received active jamming by the interference, the property over an interference can be improved and an intermodulation and cross modulation can be avoided.
[0012] And it sets to the pocket communication device of this invention. By making the current of circuits, such as RF amplifying circuit which constitutes a receive section, increase etc., only when it judges with the input signal having received active jamming by the interference When it judges with making linearity of the circuit concerned good and the input signal having not received active jamming by the interference in the time of reception from the first at the time of transmission Since the above-mentioned processing is not performed, it awaits as a cellular-phone terminal and the consumed electric current at the time etc. does not increase the consumed electric current of a pocket communication device beyond the need.
[0013]
[Embodiment of the Invention] Drawing 1 is the case where 1 operation gestalt of the pocket communication device of this invention was shown, and this invention is applied to the digital cellular phone terminal using direct spread spectrum communication. As a whole, the cellular-phone terminal of this operation gestalt is equipped with the earphone (loudspeaker) omitted by a diagram, a telephone transmitter (microphone), a control unit, a display, etc. while it is equipped with an antenna 12, the antenna common machine 13, a receive section 25, the digital-signal-processing section 23, and the transmitting section 43.
[0014] It is received by the antenna 12 and the direct spectrum diffusion signal transmission 11 from a base station is supplied to a receive section 25 through the antenna common machine 13. The

transmitting RF signal from the transmitting section 43 is transmitted from an antenna 12 through the antenna common machine 13.

[0015] After the input signal through the antenna common machine 13 is amplified by the RF amplifying circuit 14, the RF filter 15 is supplied and an image frequency component is removed from an input signal. The input signal which led the RF filter 15 is supplied to the RF mixer 16 as an intermediate frequency conversion circuit, and is changed into an intermediate frequency signal by RF local oscillation signal from the RF local oscillator 17.

[0016] The intermediate frequency signal from the RF mixer 16 is supplied to the band pass filter 18 as an intermediate frequency filter, and the intermediate frequency signal of predetermined center frequency and a predetermined band is extracted from a band pass filter 18. The intermediate frequency signal from a band pass filter 18 is supplied to the AGC (automatic gain control) amplifying circuit 19, and level is controlled to mention later.

[0017] The intermediate frequency signal from the AGC amplifying circuit 19 is supplied to the rectangular detector circuit 20, and after it gets over to I and Q baseband signaling with IF local oscillation signal from the IF local oscillator 21 and the I and Q baseband signaling are digitized by A/D converter 22, it is supplied to the digital-signal-processing section 23.

[0018] Digital signal processing, such as an error correction, is made in the digital-signal-processing section 23, and, as for the baseband signaling which the digital-signal-processing section 23 was constituted by the microcomputer equipped with CPU, ROM, and RAM, and was digitized from A/D converter 22, the baseband signaling after the processing is outputted from the digital-signal-processing section 23 as a receiving sign 24.

[0019] D/A conversion of this receiving sign 24 is carried out, the analog sound signal after that conversion is supplied to an earphone, and sound emission is carried out [voice / which was transmitted by the phase hand] from an earphone.

[0020] Moreover, A/D conversion of the sound signal collected by the telephone transmitter of this cellular-phone terminal is carried out, the digitized voice signal 41 after that conversion is supplied to the digital-signal-processing section 23, the baseband signaling for transmission is formed in the digital-signal-processing section 23, and that baseband signaling is supplied to the transmitting section 43.

[0021] Since the transmitting section 43 does not have the summary and direct relation of this invention and it can consider as a well-known configuration, that detail is omitted, but from the baseband signaling for transmission, through processing of a modulation, frequency conversion, RF magnification, etc., a transmitting RF signal is formed, and in the transmitting section 43, that transmitting RF signal is transmitted from an antenna 12 through the antenna common machine 13, as mentioned above.

[0022] With this operation gestalt, the received-power test section 31, the digital error rate test section 32, and the judgment control section 33 are formed in the digital-signal-processing section 23.

[0023] In the received-power test section 31, it gets over by the rectangular detector circuit 20, and received field strength is measured from the baseband signaling digitized by A/D converter 22. And the received-power test section 31 supplies the measurement output of the received field strength to the AGC amplifying circuit 19 as a gain control signal through a control line 34, and it controls the gain of the AGC amplifying circuit 19 so that the baseband signaling inputted into A/D converter 22 serves as fixed level.

[0024] In the digital error rate test section 32, the digital error rate in the error correction made in the digital-signal-processing section 23 as mentioned above is measured about the baseband signaling digitized from A/D converter 22.

[0025] Drawing 2 shows an example of the digital error rate test section 32, and shows the digital error rate measurement algorithm in the digital-signal-processing section 23 in functional block. In the error correction circuit 62, the error correction of the baseband signaling from A/D converter 22 outputted to Rhine 61 is carried out, and the baseband signaling after an error correction is outputted to Rhine 63.

[0026] And in a comparator circuit 64, the baseband signaling before an error correction is compared with the baseband signaling after an error correction, and it judges with a digital error rate being beyond

a predetermined error rate, if the difference among both is more than fixed, and if the difference among both is under fixed, it will judge with a digital error rate being under a predetermined error rate, and the judgment result will be outputted to Rhine 65.

[0027] In the judgment control section 33, it judges whether the input signal has received active jamming by the interference from the measurement output of the received field strength from the received-power test section 31, and the measurement output of the digital error rate from the digital error rate test section 32.

[0028] As mentioned above, even if received field strength is more than predetermined field strength, specifically If an interference which a digital error rate seldom deteriorates but affects the target input signal exists unless an interference which affects the target input signal exists Since a digital error rate deteriorates, when received field strength is more than predetermined field strength and a digital error rate is beyond a predetermined error rate, it judges with the input signal having received active jamming by the interference, and when other, it judges with the input signal having not received active jamming by the interference.

[0029] The judgment control section 33 supplies the decision output to the RF amplifying circuit 14 through a control line 35, makes the current of the RF amplifying circuit 14 increase compared with the time of judging with the input signal having not received active jamming by the interference, when it judges with the input signal having received active jamming by the interference, and makes linearity of the RF amplifying circuit 14 good.

[0030] Drawing 3 shows an example of the RF amplifying circuit 14 in this case. To the collector side of the transistor 51 for RF magnification The switch 52 switched by the decision output of the judgment control section 33 supplied through a control line 35 is formed. When judged with the input signal having not received active jamming by the interference by the judgment control section 33 A switch 52 is switched to a resistance 53 side, as shown in drawing, and a current flows from power-source Rhine 55 to the collector of a transistor 51 through a switch 52 and resistance 53. conversely, when judged with the input signal having received active jamming by the interference by the judgment control section 33 It is the case where it is constituted so that a switch 52 may be switched to the Rhine 54 side contrary to the condition of drawing and a current may flow from power-source Rhine 55 to the collector of a transistor 51 through a switch 52 and Rhine 54.

[0031] Therefore, when the judgment control section 33 judges with the input signal having received active jamming by the interference, the collector current of a transistor 51 increases, linearity of the RF amplifying circuit 14 is made good, the property over an interference is improved, and an intermodulation and cross modulation are avoided.

[0032] Moreover, at the time of transmission, from the first, also in the time of reception, when the judgment control section 33 judges with the input signal having not received active jamming by the interference, the collector current of a transistor 51 is suppressed and the consumed electric current in the RF amplifying circuit 14 is mitigated.

[0033]

[Effect of the Invention] As mentioned above, without increasing the consumed electric current in pocket communication devices, such as a digital cellular phone terminal using direct spread spectrum communication, beyond the need according to this invention, linearity of a receiving circuit can be made good and the property over an interference can be improved.

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TECHNICAL FIELD

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PRIOR ART

[Description of the Prior Art] The digital cellular phone terminal of a CDMA (Code Division Multiple Access) method using the direct spectrum diffusion which carries out spectrum diffusion of the signal transmission with a diffusion sign is actual.
[0003] A CDMA method is being the method which transmits two or more spectrum diffusion signal transmission which carried out spectrum diffusion with a mutually different diffusion sign to the same time zone and the same frequency band, and identifies each signal using the difference in a diffusion sign, and changing a diffusion sign. Since it excels in secrecy nature while the radio circuits used at a cellular-phone terminal do not run short, since two or more spectrum diffusion signal transmission can be transmitted to the same time zone and the same frequency band, the user of a cellular-phone terminal can be provided with good communication environment.

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EFFECT OF THE INVENTION

[Effect of the Invention] As mentioned above, without increasing the consumed electric current in pocket communication devices, such as a digital cellular phone terminal using direct spread spectrum communication, beyond the need according to this invention, linearity of a receiving circuit can be made good and the property over an interference can be improved.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] By the way, in a cellular-phone communication link, since FM signal transmission and spectrum diffusion signal transmission are assigned to the same communication link frequency band in recent years, FM signal transmission may exist as an interference near the spectrum diffusion signal transmission. At the digital cellular phone terminal using direct spread spectrum communication By changing an input signal into an intermediate frequency signal, and supplying the diffusion band which is a frequency band of spectrum diffusion signal transmission about the intermediate frequency signal after the conversion to the band pass filter made into a passband Although an unnecessary frequency component is removed from an input signal and he is trying to extract only desired spectrum diffusion signal transmission In the band pass filter, an interference like FM signal transmission assigned to the communication link frequency band same as mentioned above as spectrum diffusion signal transmission is unremovable.
[0005] Therefore, in order to avoid an intermodulation and cross modulation in case such an interference exists conventionally, when receiving level is more than fixed, linearity of a receiving circuit is made good by making the current of a receiving circuit increase etc.
[0006] However, neither an intermodulation nor cross modulation is necessarily produced by the interference just because receiving level is high. And the life of a cell will become short, if the current of a receiving circuit is made to always increase since it especially awaits at a cellular-phone terminal and the consumed electric current in the receiving circuit at the time influences the life of a cell greatly when receiving level is more than fixed.
[0007] Then, without increasing the consumed electric current beyond the need, this invention makes linearity of a receiving circuit good, and enables it to improve the property over an interference in pocket communication devices, such as a digital cellular phone terminal which used direct spread spectrum communication.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is drawing showing 1 operation gestalt of the pocket communication device of this invention.
[Drawing 2] It is drawing showing an example of a digital error rate test section.
[Drawing 3] It is drawing showing an example of RF amplifying circuit.
[Description of Notations]
11 -- Direct spectrum diffusion signal transmission, 12 -- An antenna, 13 -- Antenna common machine, 14 [-- RF local oscillator,] -- RF amplifying circuit, 15 -- RF filter, 16 -- RF mixer, 17 18 -- A band pass filter, 19 -- An AGC amplifying circuit, 20 -- A rectangular detector circuit, 21 -- IF local oscillator, 22 -- An A/D converter, 23 -- Digital-signal-processing section, 24 [-- A digital error rate test section, 33 / -- A judgment control section, 34 / -- A control line, 35 / -- A control line, 41 / -- A digitized voice signal, 43 / -- The transmitting section, 52 / -- A switch, 62 / -- An error correction circuit, 63 / -- Comparator circuit] -- A receiving sign, 25 -- A receive section, 31 -- A received-power test section, 32

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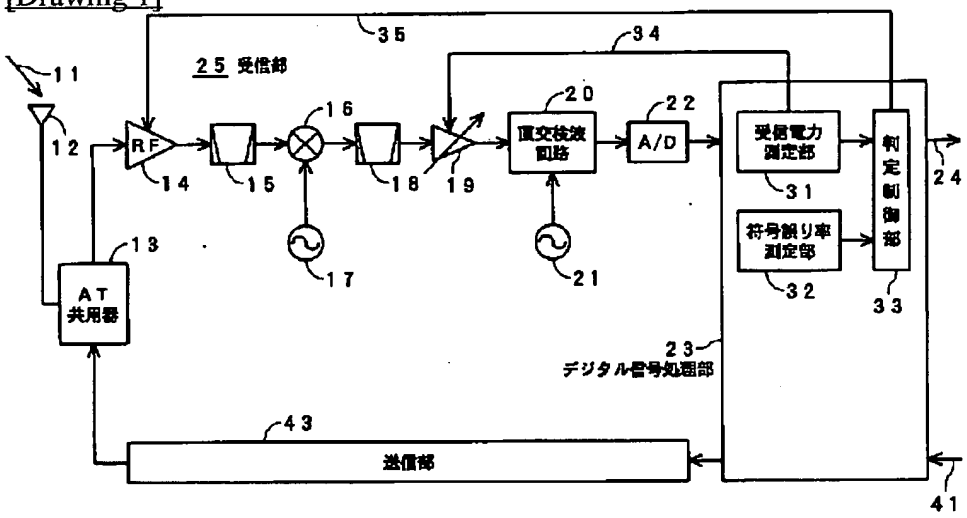
DRAWINGS

[Drawing 1]



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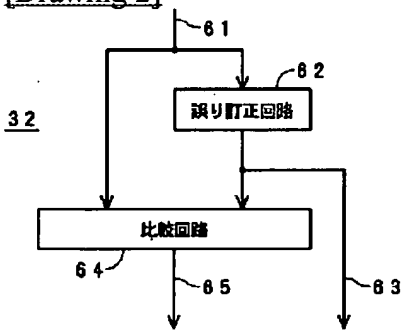
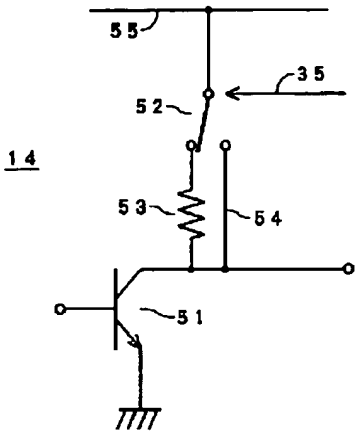


[Drawing 3]



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